

Work Order ID 100588

Wednesday, April 24, 2013 9:02:41 AM

D3118-3
B100588

100588

Page 1

Item ID: D3118-3

Accept

N900040100

Setup Start *NS1*

Revision ID:

Stop *NS2*

Item Name: Sign Assembly

Start Date: 4/24/2013 Start Qty: 12.00

12

Cust Item ID:

Required Date: 5/10/2013 Req'd Qty: 12.00

12

Customer:

Reference:

Approvals: Process Plan: *mf*

Date: *13-4-24*

Tooling:

Date:

Run Start *NR1*

QC:

Date:

SPC (Y/N):

Date:

Stop *NR2*

Sequence ID/
Work Center ID

Operation
Description

Set Up/
Run Hours

Tool ID

Tool #

Plan
Code

Accept
Qty

Reject
Qty

Reject
Number

Insp.
Stamp

Draw Nbr

Revision Nbr

D3118

D

100

0.00

100

PURCHASING

Purchasing

Memo

20966

0.00

Purchasing

Issue P/O:

19682

Manufacture as per dwg D3118

Possible Supplier: *Self powered lighting inc.*

SRB Technologies

Supplier P#: *AC/422*

9004043

Material release note required

Sign should be self-luminous to min. brightness of 160 microlamberts

110

Receive & Inspect for Damage & Mat'l Certs

0.00

110

Packaging

Memo

0.00

Packaging

Ensure Material Release Note is attached

mf *16/8/13*
13/04/24 *(12)*

14/2/14 *(12)*

PTD

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

DQA: SWT Date: 14/03/05QA Closed: SWT Date: 14/2/28

Work Order: <u>100588</u>				DISPOSITION Rework <input type="checkbox"/> Scrap <input type="checkbox"/> Use-as-is <input checked="" type="checkbox"/> Work Order Update <input type="checkbox"/>		AGAINST DEPARTMENT/PROCESS Skid-tube <input type="checkbox"/> Crosstube <input type="checkbox"/> Water Jet <input type="checkbox"/> Engineering <input type="checkbox"/> Machining <input type="checkbox"/> Small Fab <input type="checkbox"/> Prod. Eng. Coord. <input type="checkbox"/> Quality <input type="checkbox"/> Thermoforming <input type="checkbox"/> Finishing <input type="checkbox"/> Rec/Store/Packaging <input type="checkbox"/> Other <input type="checkbox"/> Large Fab <input type="checkbox"/> Composite <input type="checkbox"/> Supplier <input checked="" type="checkbox"/>					
Part No. <u>D3118-3</u>											
NCR No. <u>14-3586/14-3167</u> (Supplier) / (W/O)											
Root Cause	Date	Step	Qty	Description of work order update or Non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector		
Doc/Data <input type="checkbox"/>	<u>14/2/28</u>	<u>KO</u>	<u>12</u>	all the letter size are bigger than there were supposed to be	<u>U</u> <u>14.02.21</u>	Advised Customer for changes	<u>SWT</u> <u>14/2/28</u>	DAS 27 9:59 <u>14/2/28</u>	DAS 27 9:59 <u>14/2/28</u>		
Equip/Tooling <input type="checkbox"/>											
Operator <input type="checkbox"/>											
Material <input type="checkbox"/>											
Setup <input type="checkbox"/>											
Other <input type="checkbox"/>											
Process <input type="checkbox"/>											
Supplier <input checked="" type="checkbox"/>											
Training <input type="checkbox"/>											
Unapproved <input type="checkbox"/>											

FAULT CATEGORY											
Landing Gear <input type="checkbox"/> Bending <input type="checkbox"/> Centre Not Concentric to O/S <input type="checkbox"/> Cracks <input type="checkbox"/> Crushed/Crimped. <input type="checkbox"/> Cuffs <input type="checkbox"/> Heat Treat <input type="checkbox"/> Inspection Strip in Tube <input type="checkbox"/> Ripples in Bend <input type="checkbox"/> Torque Waves in Extrusion <input type="checkbox"/> Turning Sequence <input type="checkbox"/> Wave/Twist in Tube			General <input type="checkbox"/> Bend <input type="checkbox"/> BOM/Route <input type="checkbox"/> Broken/Damaged <input type="checkbox"/> Burrs <input type="checkbox"/> Contamination <input type="checkbox"/> Countersink <input type="checkbox"/> Cut Too Short <input type="checkbox"/> Drill Holes <input type="checkbox"/> Drawing <input type="checkbox"/> Finish <input type="checkbox"/> Folio			<input type="checkbox"/> Grain <input type="checkbox"/> Hardware <input type="checkbox"/> Inspection Incomplete <input type="checkbox"/> Instructions Incomplete/Unclear <input type="checkbox"/> Maintenance <input type="checkbox"/> Mislabeled <input type="checkbox"/> Misread <input type="checkbox"/> Offset <input type="checkbox"/> Out of Calibration <input type="checkbox"/> Out of Sequence <input type="checkbox"/> Outside Dimensions			<input type="checkbox"/> Ovalized <input type="checkbox"/> Over/Under tolerance <input type="checkbox"/> Part Incorrect <input type="checkbox"/> Part Lost/Missing <input type="checkbox"/> Part Moved <input type="checkbox"/> Positioned Wrong <input type="checkbox"/> Power Loss/Surge		<input type="checkbox"/> Pressure/Forced <input type="checkbox"/> Temperature/Cure <input type="checkbox"/> Weld <input type="checkbox"/> Wrong Stock Pulled <input type="checkbox"/> Other

Work Order ID 100588

Wednesday, April 24, 2013 9:02:41 AM

100588

Page 2

Item ID: D3118-3

Accept

N900040100Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Sign Assembly

Start Date: 4/24/2013 Start Qty: 12.00

12

Cust Item ID:

Required Date: 5/10/2013 Req'd Qty: 12.00

12

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start ***NR1***

QC:

Date:

SPC (Y/N):

Date:

Stop ***NR2***Sequence ID/
Work Center IDOperation
DescriptionSet Up/
Run Hours

Tool ID

Tool #

Plan
CodeAccept
QtyReject
QtyReject
NumberInsp.
Stamp

120

QC6- Inspect dimensions to drawing

0.00

120

QC

Memo

0.00

Quality Control

Check dims to dwg and certification attached

130

Identify as per dwg & Stock Location **ST24**

0.00

130

Packaging

Memo

0.00

Packaging

140

QC21- Final Inspection - Work Order Release

0.00

140

QC

Memo

0.00

Quality Control

DAS
26
9-89

121

14-2-21

14-02-21

14-02-21

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

DQA: _____ Date: _____

QA Closed: _____ Date: _____

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework <input type="checkbox"/> Scrap <input type="checkbox"/> Use-as-is <input type="checkbox"/> Work Order Update <input type="checkbox"/>	AGAINST DEPARTMENT/PROCESS <table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table>	Skid-tube <input type="checkbox"/>	Crosstube <input type="checkbox"/>	Water Jet <input type="checkbox"/>	Engineering <input type="checkbox"/>	Machining <input type="checkbox"/>	Small Fab <input type="checkbox"/>	Prod. Eng. Coord. <input type="checkbox"/>	Quality <input type="checkbox"/>	Thermoforming <input type="checkbox"/>	Finishing <input type="checkbox"/>	Rec/Store/Packaging <input type="checkbox"/>	Other <input type="checkbox"/>	Large Fab <input type="checkbox"/>	Composite <input type="checkbox"/>	Supplier <input type="checkbox"/>	
Skid-tube <input type="checkbox"/>	Crosstube <input type="checkbox"/>	Water Jet <input type="checkbox"/>	Engineering <input type="checkbox"/>															
Machining <input type="checkbox"/>	Small Fab <input type="checkbox"/>	Prod. Eng. Coord. <input type="checkbox"/>	Quality <input type="checkbox"/>															
Thermoforming <input type="checkbox"/>	Finishing <input type="checkbox"/>	Rec/Store/Packaging <input type="checkbox"/>	Other <input type="checkbox"/>															
Large Fab <input type="checkbox"/>	Composite <input type="checkbox"/>	Supplier <input type="checkbox"/>																

Root Cause	Date	Step	Qty	Description of work order update or Non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Doc/Data <input type="checkbox"/>									
Equip/Tooling <input type="checkbox"/>									
Operator <input type="checkbox"/>									
Material <input type="checkbox"/>									
Setup <input type="checkbox"/>									
Other <input type="checkbox"/>									
Process <input type="checkbox"/>									
Supplier <input type="checkbox"/>									
Training <input type="checkbox"/>									
Unapproved <input type="checkbox"/>									

FAULT CATEGORY

Landing Gear	General	Other
<input type="checkbox"/> Bending	<input type="checkbox"/> Bend	<input type="checkbox"/> Grain
<input type="checkbox"/> Centre Not Concentric to O/S	<input type="checkbox"/> BOM/Route	<input type="checkbox"/> Hardware
<input type="checkbox"/> Cracks	<input type="checkbox"/> Broken/Damaged	<input type="checkbox"/> Inspection Incomplete
<input type="checkbox"/> Crushed/Crimped	<input type="checkbox"/> Burrs	<input type="checkbox"/> Instructions Incomplete/Unclear
<input type="checkbox"/> Cuffs	<input type="checkbox"/> Contamination	<input type="checkbox"/> Maintenance
<input type="checkbox"/> Heat Treat	<input type="checkbox"/> Countersink	<input type="checkbox"/> Mislabeled
<input type="checkbox"/> Inspection Strip in Tube	<input type="checkbox"/> Cut Too Short	<input type="checkbox"/> Misread
<input type="checkbox"/> Ripples in Bend	<input type="checkbox"/> Drill Holes	<input type="checkbox"/> Offset
<input type="checkbox"/> Torque Waves in Extrusion	<input type="checkbox"/> Drawing	<input type="checkbox"/> Out of Calibration
<input type="checkbox"/> Turning Sequence	<input type="checkbox"/> Finish	<input type="checkbox"/> Out of Sequence
<input type="checkbox"/> Wave/Twist in Tube	<input type="checkbox"/> Folio	<input type="checkbox"/> Outside Dimensions
		<input type="checkbox"/> Ovalized
		<input type="checkbox"/> Over/Under tolerance
		<input type="checkbox"/> Part Incorrect
		<input type="checkbox"/> Part Lost/Missing
		<input type="checkbox"/> Part Moved
		<input type="checkbox"/> Positioned Wrong
		<input type="checkbox"/> Power Loss/Surge
		<input type="checkbox"/> Pressure/Forced
		<input type="checkbox"/> Temperature/Cure
		<input type="checkbox"/> Weld
		<input type="checkbox"/> Wrong Stock Pulled
		<input type="checkbox"/> Other

Picklist Print

Wednesday, April 24, 2013 9:02:41 AM

Page 1

Work Order ID: 100588

Parent Item: D3118-3

Parent Item Name: Sign Assembly

Start Date: 4/24/2013

Required Date: 5/10/2013

Start Qty: 12.00

Required Qty: 12.00

Comments: IPP A: 02.05.15 New Issue NG
DWG REV.D DD VERF:EC

IPP REV:B 12.05.11 AS PER

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
AC47L Sign Assembly		Purchased	No				Each	0.0000		12		10/4/2/14/12	

9004043 0214/02/14

NCR: Yes / No

WORK ORDER NON-CONFORMANCE / UPDATE

DQA: _____ Date: _____

QA Closed: _____ Date: _____

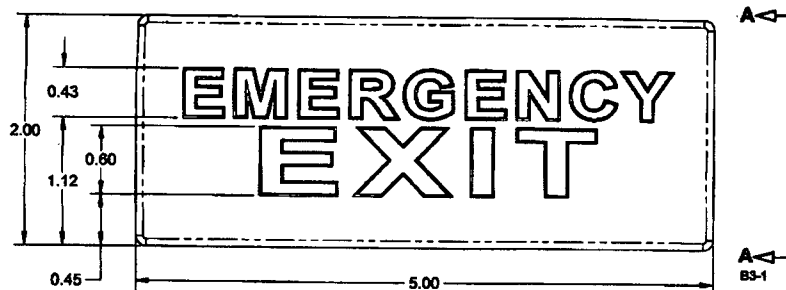
Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework <input type="checkbox"/> Scrap <input type="checkbox"/> Use-as-is <input type="checkbox"/> Work Order Update <input type="checkbox"/>	AGAINST DEPARTMENT/PROCESS <table style="width: 100%;"> <tr> <td>Skid-tube <input type="checkbox"/></td> <td>Crosstube <input type="checkbox"/></td> <td>Water Jet <input type="checkbox"/></td> <td>Engineering <input type="checkbox"/></td> </tr> <tr> <td>Machining <input type="checkbox"/></td> <td>Small Fab <input type="checkbox"/></td> <td>Prod. Eng. Coord. <input type="checkbox"/></td> <td>Quality <input type="checkbox"/></td> </tr> <tr> <td>Thermoforming <input type="checkbox"/></td> <td>Finishing <input type="checkbox"/></td> <td>Rec/Store/Packaging <input type="checkbox"/></td> <td>Other <input type="checkbox"/></td> </tr> <tr> <td>Large Fab <input type="checkbox"/></td> <td>Composite <input type="checkbox"/></td> <td>Supplier <input type="checkbox"/></td> <td></td> </tr> </table>	Skid-tube <input type="checkbox"/>	Crosstube <input type="checkbox"/>	Water Jet <input type="checkbox"/>	Engineering <input type="checkbox"/>	Machining <input type="checkbox"/>	Small Fab <input type="checkbox"/>	Prod. Eng. Coord. <input type="checkbox"/>	Quality <input type="checkbox"/>	Thermoforming <input type="checkbox"/>	Finishing <input type="checkbox"/>	Rec/Store/Packaging <input type="checkbox"/>	Other <input type="checkbox"/>	Large Fab <input type="checkbox"/>	Composite <input type="checkbox"/>	Supplier <input type="checkbox"/>	
Skid-tube <input type="checkbox"/>	Crosstube <input type="checkbox"/>	Water Jet <input type="checkbox"/>	Engineering <input type="checkbox"/>															
Machining <input type="checkbox"/>	Small Fab <input type="checkbox"/>	Prod. Eng. Coord. <input type="checkbox"/>	Quality <input type="checkbox"/>															
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Large Fab <input type="checkbox"/>	Composite <input type="checkbox"/>	Supplier <input type="checkbox"/>																

Root Cause	Date	Step	Qty	Description of work order update or Non-conformance	Initial Chief Eng	Action Description	Sign & Date	Verification	QC Inspector
Doc/Data									
Equip/Tooling									
Operator									
Material									
Setup									
Other									
Process									
Supplier									
Training									
Unapproved									

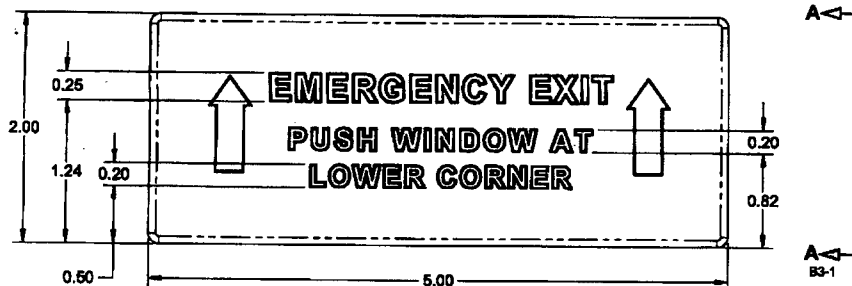
FAULT CATEGORY

Landing Gear <input type="checkbox"/> Bending <input type="checkbox"/> Centre Not Concentric to O/S <input type="checkbox"/> Cracks <input type="checkbox"/> Crushed/Crimped. <input type="checkbox"/> Cuffs <input type="checkbox"/> Heat Treat <input type="checkbox"/> Inspection Strip in Tube <input type="checkbox"/> Ripples in Bend <input type="checkbox"/> Torque Waves in Extrusion <input type="checkbox"/> Turning Sequence <input type="checkbox"/> Wave/Twist in Tube	General <input type="checkbox"/> Bend <input type="checkbox"/> BOM/Route <input type="checkbox"/> Broken/Damaged <input type="checkbox"/> Burrs <input type="checkbox"/> Contamination <input type="checkbox"/> Countersink <input type="checkbox"/> Cut Too Short <input type="checkbox"/> Drill Holes <input type="checkbox"/> Drawing <input type="checkbox"/> Finish <input type="checkbox"/> Folio	<input type="checkbox"/> Grain <input type="checkbox"/> Hardware <input type="checkbox"/> Inspection Incomplete <input type="checkbox"/> Instructions Incomplete/Unclear <input type="checkbox"/> Maintenance <input type="checkbox"/> Mislabeled <input type="checkbox"/> Misread <input type="checkbox"/> Offset <input type="checkbox"/> Out of Calibration <input type="checkbox"/> Out of Sequence <input type="checkbox"/> Outside Dimensions <input type="checkbox"/> Ovalized <input type="checkbox"/> Over/Under tolerance <input type="checkbox"/> Part Incorrect <input type="checkbox"/> Part Lost/Missing <input type="checkbox"/> Part Moved <input type="checkbox"/> Positioned Wrong <input type="checkbox"/> Power Loss/Surge <input type="checkbox"/> Pressure/Forced <input type="checkbox"/> Temperature/Cure <input type="checkbox"/> Weld <input type="checkbox"/> Wrong Stock Pulled <input type="checkbox"/> Other
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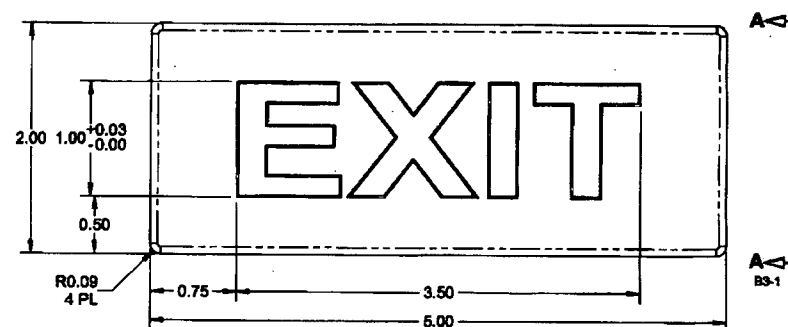
SPECIFICATION CONTROL DRAWING



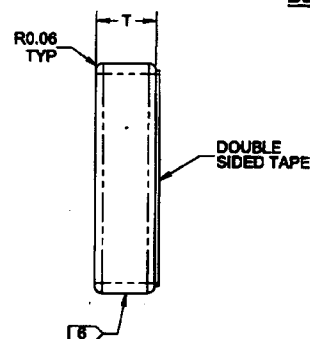
D3118-1 SIGN ASSEMBLY
REPLACES PREMIER P/N 027-57000-01,
BHT P/N 46660-01008-00



D3118-3 SIGN ASSEMBLY
REPLACES PREMIER P/N 027-57000-03,
BHT P/N 212-072-637-107



D3118-5 SIGN ASSEMBLY



VIEW A-A
C5-1
C1-1
B6-1

NOTES:

- 1) MATERIAL: POLYCARBONATE
- 2) FINISH: N/A
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED
- 5) BREAK SHARP EDGES: N/A
- 6) IDENTIFICATION: WITH DART P/N "D3118-X" AND B/N "BXXXXX" PER DART QSI 044 6.1
- 7) WEIGHT: 0.30 lbs EACH
- 8) POSSIBLE SUPPLIER: SRB TECHNOLOGIES (CANADA), INC.
320-140 BOUNDARY ROAD
PEMBROKE, ONTARIO, K8A 6W5
PHONE: 613-732-0055
FAX: 613-732-0066
- 9) SEE TABLE FOR SUPPLIER PROCUREMENT P/N'S
- 10) SIGNS SHOULD BE A RED BACKGROUND, CLEAR LETTERING WITH WHITE BORDER AROUND EACH LETTER
- 11) SIGNS SHOULD BE SELF-LUMINOUS TO MINIMUM BRIGHTNESS OF 160 MICROLAMBERTS

REV.	DESCRIPTION	BY	DATE
E	REVISE SUPPLIER AND SUPPLIER PART NUMBERS	SFM	13.07.18
D	UPDATED TO COMPLY WITH QSI 043; ADDED SUPPLIER P/N PROCUREMENT CHART (ZNA4-1). REF: PAR11-127	MB	11.11.02
C	ADD D3118-5	RF	09.02.22
B	ADD MINIMUM BRIGHTNESS = 160 MICROLAMBERTS	RF	04.05.05
A	NEW ISSUE	RF	02.04.15
DESIGN			
DRAWN	SFM		
CHECKED	R		
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	13.07.16		

DART PART NUMBER	SUPPLIER PART NUMBER	THICKNESS "T"
D3118-1	9004030	0.52
D3118-3	9004043	0.52
D3118-5	9004001	0.66

RELEASED
2013-08-01
MP

DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWING NO. D3118	REV. E SHEET 1 OF 1
TITLE SIGN ASSEMBLY	
SCALE NTS	
COPYRIGHT © 2002 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE UNDERSTANDING THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON OR ENTITY WITHOUT THE WRITTEN PERMISSION FROM DART AEROSPACE LTD.	



Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON K6A 1K7
Tel: 613 632 9577
Fax: 613 632 1053

PURCHASE ORDER

Purchase Order ID PO20966

Purchase Order Date 16/08/2013

PO Print Date 16/08/2013

Page Number 1 of 1

Order From : VC-SRB001

SRB TECHNOLOGIES (CANADA), INC.
320 - 140 BOUNDARY ROAD

PEMBROOKE, ONTARIO K8A 6W5
CANADA

Ship To : DART AEROSPACE LTD

1270 ABERDEEN
HAWKESBURY, ON K6A 1K7
CANADA

Contact Name

Vendor Phone

Ship To Contact

Ship To Phone

Ship Via:

FedEx PI collect

Ship Acct:

Buyer

Customer POID

Customer Tax #

Terms

Currency

FOB

10127-2607

Net 30

CAD

FCA - (Free Carrier)

Line Nbr	Reference Vendor Part Number	Description/ Mfg ID	Req Date/ Taxable	CD	Req Qty/ Unit of Measure	PO Unit Price	Extended Price
	Line Comments		Promise Date				
	Delivery Comments						
1	9004043	Sign Assembly	08/11/2013 Yes 08/11/2013		12.00 Each	\$367.73	\$4,412.76
NOTE Manufacture as per drawing D3118-3 rev.E B100588 *****							
Line Total:							\$4,412.76
2	71500-15	Setup Charge	08/11/2013 No 08/11/2013		1.00	\$600.00	\$600.00
Line Total:							\$600.00
PO Total:							\$5,012.76

Note: Pricing listed above is as per contract agreement between Dart Aerospace and the respective manufacturer.
No substitution or deviation without consent.
Certificate of Conformity or Material Certification required - YES NO
PST# 6122-5207

Change Nbr:

2

Change Date: 16/08/2013

M. Grogan

SRB TECHNOLOGIES (CANADA) INCORPORATED

SRB16872

320 Boundary Road, Suite 140, Pembroke, Ontario, Canada; Phone (613) 732-0055

SHIPMENT PACKING SLIP AND MANIFEST

DATE:	February 13, 2014
WAYBILL #:	Fedex: 5820 8844 2889
DESTINATION:	Dart Aerospace Ltd.; Hawkesbury, ON, Canada

[illegible]**TYPE OF SHIPMENT:**☐ UN2915 ☒ UN2911 ☐ UN2910 ☐ REGULAR

<input type="checkbox"/>	OTHER (SPECIFY):	
--------------------------	------------------	--

NO. OF PACKAGES:		1		PACKED BY:		Shane Pleau - Import/Export Specialist	
TOTAL ACTIVITY:		66.60		Ci.		ATTN: Receiving	
DIM (in):		9 X 9 X 11		www.betalight.com		SHIPMENT WEIGHT (lbs.)	
						4	



ISO 9001

SRB TECHNOLOGIES (CANADA) INC.320-140 Boundary Road
Pembroke, Ontario, Canada, K8A 6W5

Tel.: (613) 732-0055

Fax: (613) 732-0056

E-Mail: sales@betalight.com

Web: www.betalight.com

CERTIFICATE OF CONFORMANCE**ACCOUNT TO:**Dart Aerospace Ltd.
1270 Aberdeen Street
Hawkesbury, ON
Canada K6A 1K7**CERTIFICATE OF CONFORMANCE ID:**

CDN002595

YOUR REFERENCE:

PO20966

OUR REFERENCE:

PO20966

DATE:

February 13, 2014

ITEM #	PART NUMBER	DESCRIPTION/ SPECIFICATION	QUANTITY	REMARKS/ DELIVERY POSITION
1	9004043 SRB P/N: 9004043	Sign Assembly T 5.55 Ci. (205.35 GBq) S/N's: 20083 - 20094	12	Batch # PO20966 Mfg. February/2014

This is to certify that the whole of the material and/or parts described herein have been manufactured to the quality standards registered under ISO 9001:2008 and conform to the full specification of the appropriate drawings and purchase order requirements.

Test methods for Betalights™ and devices containing Betalights™, including leakage and surface contamination, conform to the British Defence Standard 62-4/4 and/or ANSI/HPS N43.4-2000.

Signed for on behalf of SRB Technologies (Canada) Inc.


T. Sennett, Import/Export Manager

Tritium (H-3)

Chemical Symbol:	H	Common Names: Tritium
Atomic Number:	1	Atomic Weight: 3
Physical Half-life:	12.35 years	
CNSC Exemption Quantity:	1.0e9 Bq (1.0 GBq)	

Note: A CNSC license is not required if the amount of radionuclide possessed is less than one Exemption Quantity.

Principal Emissions	Average Energy (MeV)**	Maximum Energy (MeV)***	Dose Rate @ 1 meter (mSv/h*GBq)	Recommended Shielding
Neutrons	-	n/a	n/a	n/a
Gamma/ X-rays	-	n/a	n/a	n/a
Beta*	0.005685	0.018601	n/a	n/a
Alpha	-	n/a	n/a	n/a

* Where beta emission is present, bremsstrahlung radiation is produced. Shielding may be required.

** Average energy of the most abundant emission.

*** Maximum energy of the most abundant emission.

Progeny: **He-3 (stable)**

Method of Detection

Wipes counted by liquid scintillation.

Dosimetry

External: N/A

Internal: urinalysis (bioassay)

Personal Protection

Always use the principals of time, distance and shielding to minimize dose.

Consult CNSC licensee for requirements concerning engineering controls, protective equipment, and special storage requirements.

ICRP Data

	Ingestion	Inhalation	
Compound Type	Tritiated water	Tritiated water	Elemental tritium
Annual Limit on Intake (Bq)	1.0e09	1.0e09	1.0e13

Emergency

The following is a guide for first responders. Qualified individuals should carry out the following actions, including remediation. In cases where life-threatening injury has resulted, **first** treat the injury, **second** deal with personal contamination.

Personal Decontamination Techniques

- Wash well with soap and water, then monitor skin,
- Do not abrade skin, only blot dry,
- Decontamination of clothing and surfaces are described in operating and emergency procedures.

Spill and Leak Control

- Alert persons in the immediate area,
- Confine the problem or emergency (includes the use of absorbent material),
- Clear area,
- Summon assistance.

Emergency Protective Equipment, Minimum Requirements

- Gloves (vinyl preferred, or latex),
- Footwear covers,
- Safety glasses,
- Outer layer or easily removed protective clothing,
- Suitable respirator selected.

Radiation Safety Data Sheet: TRITIUM
CNSC Fact Sheet

Page 2 of 2

Common used form: tritiated gas, tritiated water, tritiated labeled compounds (e.g. streptomycin, cortisone, epinephrine, octadecane and stearic acid), and Nucleic Acid Precursors.

Source: Reactor produced (main source) and naturally occurring.

Examples of use: radioactive tracer in chemical, biochemical and biological research, industrial gauging, and consumer products (e.g. light sources, watches, gas chromatographs).

Radiological Data

- **Half-life:** 12.35 years
- **Maximum range in air:** 6 mm
- **Maximum range in water:** 0.006 mm
- **Mass/Activity:** 2.81e-06 g/GBq (1.04e-04 g/Ci)
- **Specific Activity:** 3.56 e+05 GBq/g (9.61e+03 Ci/g)
- **Bremsstrahlung:** insignificant
- **Emission:** Beta-; $E_{\max} = 0.0186\text{MeV}$, $E_{\text{ave}} = 0.005683\text{MeV}$
- **Decay mode:** H-3 (12.35a) \rightarrow He-3 (stable) + β^- + neutrino
- **Radiation Dose Rate:** NA
- **Radio toxicity:** IAEA Class 4- low toxicity
 - Tritium is not a radiation hazard unless it enters the body. Once in the body, tritium water is uniformly distributed in the body water and can then irradiate live tissue. Inhaled tritium gas will irradiate the lungs. Tritiated water is 10,000 times more radiotoxic than tritium gas. Tritium thymidine will be concentrated in the nuclei of DNA synthesizing cells and may result in chromosome damage.
- **Other Considerations:**
 - Tritiated water can be absorbed through the surface of the skin, leading to an internal exposure. Gaseous tritium is a fire and explosion hazard in high concentrations when exposed to heat or flame and can react with oxidizing materials.
- **Safety Precautions:**
 - **Protective clothing:** Lab coat, PVC gloves preferred or latex gloves, mainly for surface contaminated areas. For high airborne tritium (TBq levels), a plastic suit and respirator may be required.
- **First Aid:**
 - **Ingestion:** elimination rates may be increased by increasing liquid consumption, or, for serious uptakes, dialysis. Treatment should be initiated as soon as possible following time of intake.
 - **Inhalation:** elimination rates may be increased by increasing liquid consumption, or, for serious uptakes, dialysis. Treatment should be initiated as soon as possible following time of intake.
 - **Skin Contact:** elimination rates may be increased by increasing liquid consumption, or, for serious uptakes, dialysis. Treatment should be initiated as soon as possible following time of intake.
- **Control:**
 - **Urinalysis by liquid scintillation:** detection limit = 100 Bq/L
 - **Skin Decontamination:** tritiated water is absorbed into skin tissue. Wash skin immediately for 5 – 10 minutes with soap and water. If necessary, for full body exposure, a shower should be taken as soon as possible after skin contact.
 - **Spills:** clean up tritiated water spills with a wet cloth or mop to dilute and absorb the tritiated water. Spills may also be absorbed on material such as clay and vermiculite.
 - **Disposal:** dispose of as required by the competent authority, CNSC, in Canada.
 - **Shielding:** No shielding is required as tritium has a very low energy beta emission that cannot even penetrate the dead layer of skin.
- **Recommended Limits:**
 - **For ingestion:** ALI = 1.0e9 Bq
 - **For inhalation:** ALI = 1.0e9 Bq (type F); 1.0e13 Bq (type M)
 - DAC = 4.0e5 Bq/m³ (type F); 5.0e9 Bq/m³ (type M)
- **Maximum release concentration (atmospheric release):** 37 kBq/m³
- **Maximum release concentration (waterborne release):** 1000GBq/a
- **Maximum release concentration (solid waste):** 37 MBq/kg
- **Exemption quantity:** 1.0e9 Bq